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FLOWERING CALENDAR FOR RESERVE No. 3694 IN METROPOLITAN PERTH

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ABSTRACT

A species list of vascular plants has been compiled for a 6-hectare area of remnant bushland in inner metropolitan Perth. Flowering periods of native and alien species have been recorded over a two year period with brief notes on vegetation and physical features, the correlation between flowering and rainfall, and the conservation value of the reserve are provided.

INTRODUCTION

During 1980-1981 a monthly survey was made of all vascular plant species (i.e. flowering plants and gymnosperms) conducted on Reserve No. 3694, a vacant

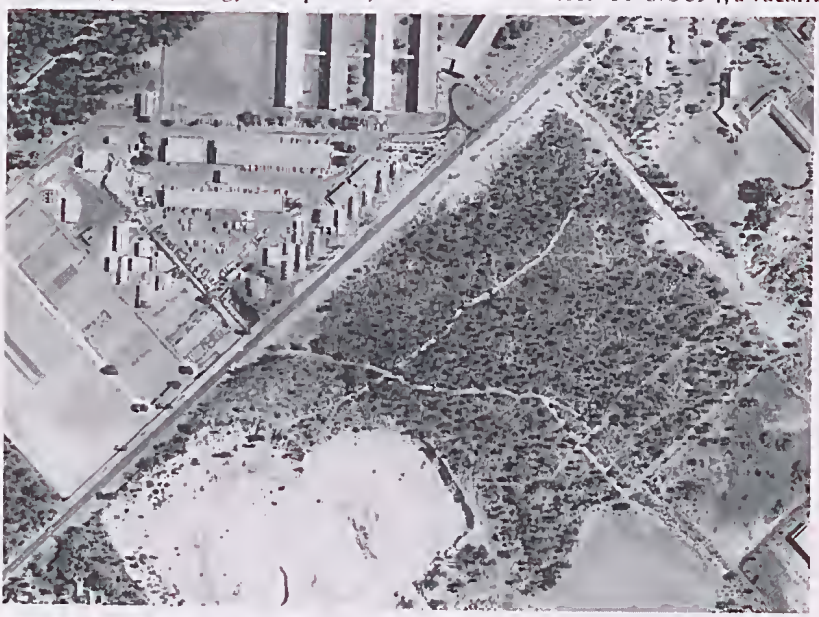

Figure 1: Aerial photograph of Western Australian Department of Agriculture complex and Reserve No. 3694.

block adjacent to the Department of Agriculture, Baron-Hay Court (formerly Jarrah Road) Kensington (Figure 1). Records were made of those species flowering so that a comprehensive flowering calendar could be developed (Table 1).

METHOD

A survey of the reserve was conducted to establish a species list and a route that could be used to ensure a consistent sampling of the flora present. This route was based on existing tracks and fire breaks with transects through portions of the reserve not covered by the established tracks. A monthly record of the observed flowering species was compiled over a two year period with any new species being added as they were located. These recordings were all conducted within the second week of each month to establish a consistent time of observation. A voucher specimen of each species was collected and housed in the Western Australian Herbarium.

DISCUSSION

The reserve covers 6 hectares of remnant *Banksia* woodland which is relatively undisturbed despite its lack of management and its inner metropolitan location. The soils of the area are composed mainly of grey humic Bassendean sands overlying deep yellow sand with some development of deep limestone.

Three basic vegetation types are represented (Figure 2). These are Low *Banksia* Woodland, Low *Banksia/Eucalyptus* Woodland, Low Shrubland.

The Low *Banksia/Eucalyptus* Woodland contains two species of *Eucalyptus* and *Allocasuarina fraseriana*, in addition to *Banksia* species, and it is associated with Low Shrubland in the north and north east of the reserve. The Low Shrubland area may indicate the presence of a dampland (Semeniuk 1987).

A marked correlation between the number of species flowering each month (Figure 3) and monthly rainfall for the two years (Figure 4) was observed. This apparent relationship between species richness and the availability of moisture is expressed as the spring flush. This flush occurs at a time of warming temperatures and plentiful moisture enabling a large percentage of species to flower and utilise these resources. The rainfall was delayed in 1981: Figure 3 shows the resultant flush occurring later than that observed in 1980. During 1980-1981 the temperature regime was consistent (Figure 4). Although temperature has an effect on the flowering time, it appears the availability of moisture dictates the duration of flowering and level of species richness. As can be noted from Table 1 the number of species flowering during the warmer months is reduced.

The data presented shows that over the two years not all of the recorded species flower annually and that others can flower monthly. Some of the species were not recorded flowering at all during the two year survey, notably *Eucalyptus todtiana* and *Macrozamia riedlei*. Table 2 provides a breakdown of the number of native and naturalised (weedy) species flowering each month over the two years, enabling us to see a variation in the number of flowering species during this time.

Table 3, showing a selection of major families on the reserve and their ratio of

Figure 2: Vegetation Map of Reserve No. 3694. 1 - Cleared Fire Break, 2 - Low *Banksia* Woodland, 2a - Low *Banksia/Eucalyptus* Woodland, 3 - Low Shrubland.

native to naturalised species, gives some indication of the extent of weed invasion. Overall, natives total 70% of the listed flora. This is probably a high native species level in a suburban area where the weed infestation and degradation could be far more extensive. Annual weeds and perennial grasses create an additional fuel load. It is likely that with any increasing frequency of fires there will be a corresponding increase in the number and extent of annual weed species and a resultant decline in native species richness. Thus a potential weed threat was identified in the reserve.

Like many bush areas around Perth this reserve has been used for the dumping of rubbish, mainly garden refuse. As a result of this activity *Chamelaucium uncinatum*, a species that once may have occurred in the reserve, has been re-established. Table 3 shows that the main weed (naturalised) species are those that have been associated with and used in agriculture with the occasional horticultural species.

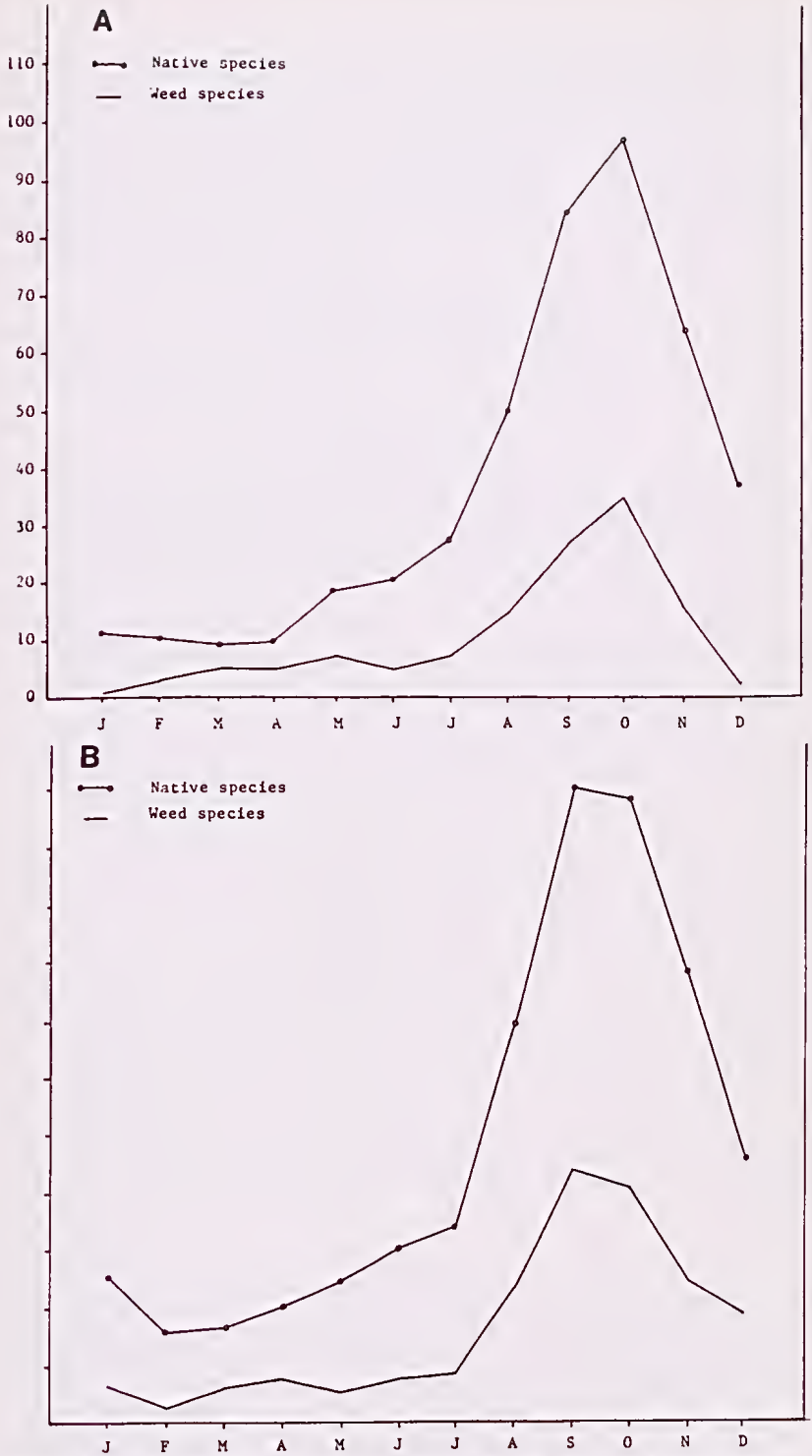

Figure 3: A = Monthly flowering diversity 1980. B = Monthly flowering diversity 1981.

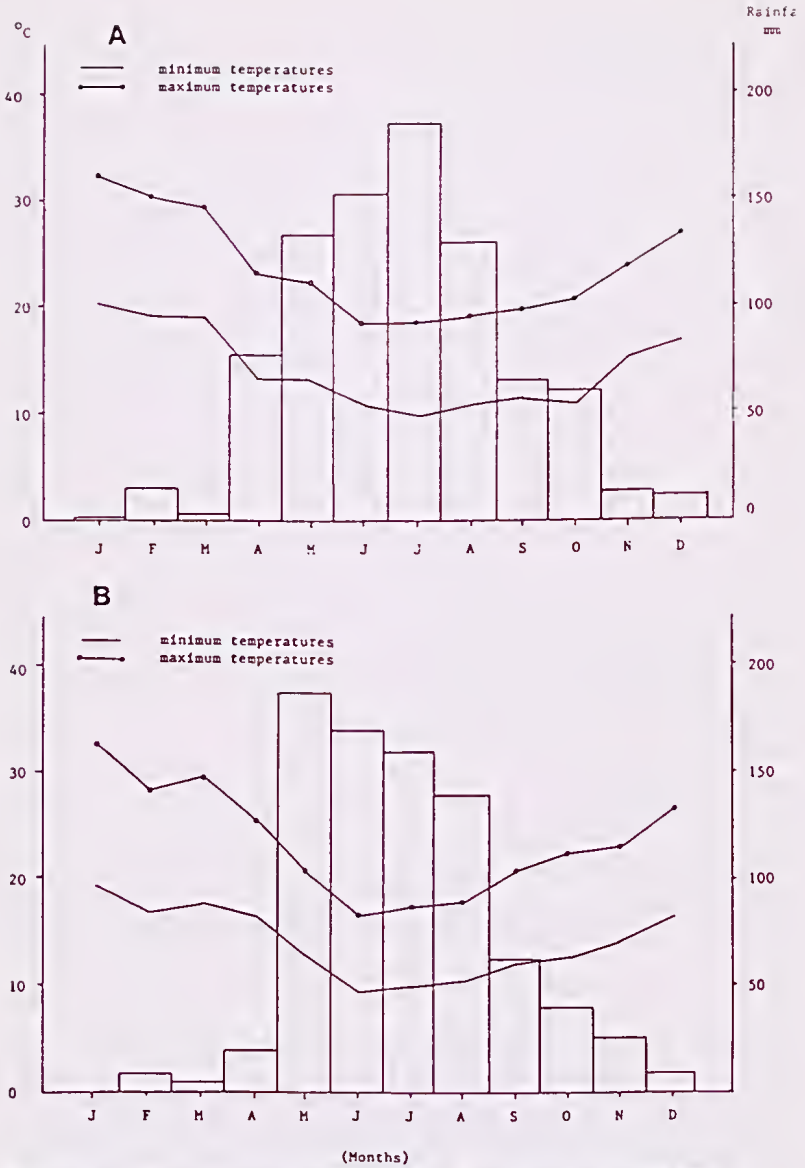

Figure 4: A = Temperature and rainfall 1980. B = Temperature and rainfall 1981.

CONCLUSIONS

As stated, this survey was conducted primarily in order to produce the flowering calendar for Reserve No. 3694 presented in Table 1, which provides a guide to the flowering species that may be expected in any given month. The additional information presented above argues for the conservation value of this reserve. The faunal richness of this reserve was demonstrated by Turpin (1990) who argued for maintaining representatives of natural communities which were once widespread.

Although, during the two year survey reported here, the total area of weed infestation did not vary, a brief inspection conducted during September 1989 (eight years after the survey) revealed a marked increase in weed infestation and degradation. This degree of degradation is still at a level that can be reversed by the application of suitable management techniques. It is our conviction that the formulation and adoption of a formal management program would help prevent a valuable species-rich area from developing into a source of weed seed and vermin.

ACKNOWLEDGEMENTS

We wish to thank N.G. Marchant and N.S. Lander for their guidance and encouragement.

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Table 1: Species listed for Reserve 3694 and months in which flowers were recorded. * = introduced species.

Species	1980 J	F	M	A	M	J	J	A	S	O	N	D	1981 J	F	M	A	M	J	J	A	S	O	N	D
Acacia																								
huegelii											X													X
pulchella																				X				
sphacelata							X													X				
stenoptera			X	X	X												X	X	X					
willdenowiana						X	X												X	X				
Adenanthos																								
cygnorum	X	X			X				X	X		X	X	X	X					X		X	X	X
**Aira*																								
caryophyllea										X											X	X		
Alexgeorgea																								
arenicola																								
Allocasuarina																								
fraseriana																				X	X			
humilis						X	X	X	X											X	X	X		
**Anagallis*																								
arvensis										X	X											X	X	X
Anigozanthos																								
humilis																						X	X	
Amocrinum																								
preissii											X		X											X

Species	1980 J	F	M	A	M	J	J	A	S	O	N	D	1981 J	F	M	A	M	J	J	A	S	O	N	D
*Arctotheca calendula								X	X	X	X									X	X	X	X	
Astroloma pallidum					X	X	X	X	X	X	X		X	X	X	X	X	X	X	X				
*Avena barbata									X	X										X	X	X	X	
*Babiana stricta																				X				
Banksia attenuata	X										X	X	X										X	X
Banksia ilicifolia									X	X	X	X							X	X	X	X	X	X
Banksia menziesii		X	X	X	X	X	X	X					X	X	X	X	X	X	X	X				
Bossiaea eriocarpa									X	X										X	X	X		
Brachycome bellidioides									X											X				
*Brassica tournefortii						X	X	X	X									X	X	X	X	X		
*Briza maxima								X	X	X										X	X	X	X	
Briza minor									X	X	X										X	X		
*Bromus diandrus									X	X	X										X	X		
Bromus rubens										X												X		
Burchardia umbellata									X	X											X	X		
Caladenia discoidea																					X			
Caladenia flava									X												X			
Caladenia huegelii																					X			
Caladenia longicauda									X	X											X			
Calandrinia corrigioloides										X	X											X	X	
Calandrinia granulifera									X													X	X	
Calectasia cyanea						X	X	X	X	X	X						X	X	X	X	X	X	X	X
Calothamnus sanguineus						X	X	X								X	X	X	X	X				
Calytrix angulata										X												X		
Calytrix flavescens	X									X	X		X	X									X	
Calytrix fraseri	X												X			X							X	
Cassytha racemosa																					X	X		
*Centranthus macrosiphon																				X	X	X		
*Chamaescilla corymbosa																			X	X				
*Chamelaucium uncinatum								X	X	X										X	X			
Comesperma calymega										X	X										X	X		
Conostephium pendulum					X	X	X	X	X						X	X	X	X	X	X				
Conostephium preissii													X	X	X	X	X	X						
Conostylis aculeata																								

Species	1980 J	F	M	A	M	J	J	A	S	O	N	D	1981 J	F	M	A	M	J	J	A	S	O	N	D
ssp. aculeata								X	X	X											X	X		
aurea									X											X	X	X		
juncea							X	X	X	X									X	X	X	X	X	
setigera								X	X											X	X	X		
*Conyza																								
bonariensis	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X			X	
sp.															X									
Corynotheca																								
micrantha											X											X	X	
Crassula																								
glomerata								X	X	X										X				
*Cynodon																								
dactylon			X	X	X								X	X	X	X					X	X	X	
Dampiera																								
linearis	X					X	X	X	X	X	X		X						X	X	X	X	X	
Dasypogon																								
bromeliifolius										X	X		X									X	X	
Daviesia																								
divaricata						X	X	X	X	X	X							X	X	X	X	X		
nudiflora						X	X	X										X	X					
triflora				X	X	X	X	X								X	X	X	X					
Dianella																								
revoluta										X	X										X	X	X	
Digitaria																								
sanguinalis															X	X								
Dodonaea																								
hackettiana																		X	X					
Drosera																								
huegelii																			X					
macrantha									X	X														
menziesii																					X			
stolonifera								X											X					
*Ehrharta																								
calycina				X	X	X	X	X	X	X			X			X			X	X	X	X	X	
longiflora																						X		
*Eragrostis																								
curvula				X						X	X		X		X	X		X	X		X	X		
Eremaea																								
pauciflora										X	X		X								X	X	X	
Eriostemon																								
spicatus								X	X	X						X		X	X	X	X			
Erodium																								
botrys									X	X	X								X	X	X	X	X	
Eucalyptus																								
todtiana																								
marginata										X	X											X	X	
Euphorbia																								
peplus										X									X	X	X	X		
terracina								X	X	X	X								X	X	X	X	X	
Freesia																								
leichtlinii																			X	X				
*Fumaria																								
capreolata									X	X											X	X		
*Gladiolus																								
caryophyllaceus							X	X	X															
Gompholobium																								
tomentosum	X	X						X	X	X	X	X	X			X	X	X	X	X	X	X	X	

Species	1980 J	F	M	A	M	J	J	A	S	O	N	D	1981 J	F	M	A	M	J	J	A	S	O	N	D
Haemodorum spicatum										X	X												X	X
Hardenbergia comptoniana								X	X									X	X	X				
**Hedypnois rhagadioloides*																				X	X	X		
**Helianthus sp.*	X	X																						
**Heliophila pusilla*								X	X											X	X			
Helipterum cotula								X	X										X	X	X			
Hemiandra pungens									X	X	X											X	X	X
Hibbertia huegelii								X	X	X								X		X	X	X		
hypericoides						X	X	X	X	X	X	X						X	X	X	X	X	X	X
racemosa							X	X	X	X	X								X	X	X	X	X	
**Hordeum leporinum*									X											X	X			
Hovea trisperma						X	X	X										X	X	X		X		
Hybanthus calycinus								X	X	X	X									X	X	X	X	
**Hyparrhenia hirta*		X	X	X																				
Hypocalymma robustum								X	X	X	X	X								X	X	X	X	
**Hypochaeris glabra*									X	X	X		X			X				X	X	X	X	X
Isolepis marginata									X	X												X	X	
Isotropis cuneifolia								X												X				
Jacksonia furceolata	X	X	X									X	X	X	X									X
lehmannii								X	X	X	X											X	X	X
sternbergiana	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Johnsonia pubescens								X												X	X			
Kennedia prostrata								X												X	X	X		
Lagenifera huegelii																			X	X				
**Lagurus ovatus*																				X	X			
Laxmannia squarrosa								X	X	X										X	X	X		
Lepidobolus preissianus								X												X	X			
Lepidosperma angustatum															X									
Leptomeria cunninghamii									X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Leptospermum spinescens									X	X												X	X	

Species	1980 J	F	M	A	M	J	J	A	S	O	N	D	1981 J	F	M	A	M	J	J	A	S	O	N	D
Leucopogon																								
conostephioides	X	X	X												X	X	X	X						
parviflorus													X	X										
Levenhookia																								
stipitata																						X		
Lobelia																								
tenuior									X	X												X		
**Lolium*																								
perenne					X	X	X								X			X	X	X	X			
Lomandra																								
caespitosa					X	X												X	X					
hermaphrodita																								
nigricans				X												X	X	X						
preissii			X	X											X	X	X							
suaveolens					X													X						
Loxocarya																								
flexuosa								X	X												X			
**Lupinus*																								
sp. 1						X	X											X						
sp. 2						X	X											X						
Lyginia																								
barbata					X	X	X	X	X				X				X	X	X	X	X			
Lysinema																								
ciliatum				X	X	X	X									X	X	X	X	X				
Macarthuria																								
australis					X	X	X	X								X	X	X	X	X				
Macrozamia																								
riedlei																								
**Medicago*																								
polymorpha						X	X											X	X	X	X			
Melaleuca																								
scabra							X	X	X												X	X	X	
Mesomelaena																								
pseudostygia	X	X	X											X	X	X								
**Mirabilis*																								
jalapa														X	X	X							X	
Monotaxis																								
grandiflora						X	X	X	X										X	X	X	X		
Neurachne																								
alopecuroidea							X	X	X															
Nuytsia																								
floribunda									X				X										X	
Olearia																								
paucidentata		X	X	X																				
Orobanche																								
minor						X	X											X	X	X				
**Osteospermum*																								
clandestinum				X	X	X		X									X	X	X	X	X			
**Oxalis*																								
pes-caprae			X	X	X	X	X									X	X	X	X					
Oxylobium																								
capitatum					X													X						
Patersonia																								
occidentalis						X	X	X	X											X	X	X	X	
**Pelargonium*																								
capitatum																				X	X	X	X	
**Pentaschistis*																								
airoides								X												X	X			

Species	1980 J	F	M	A	M	J	J	A	S	O	N	D	1981 J	F	M	A	M	J	J	A	S	O	N	D
Persoonia																								
sulcata									X	X	X													X
Petrophile																								
macrostachya									X	X											X			
linearis									X	X											X	X	X	
**Petrorhagia*																								
velutina								X	X											X	X	X		
Phlebocarya																								
ciliata								X	X											X	X	X		
Pimelea																								
sulphurea							X	X												X	X			
**Poa*																								
annua																			X					
Podotheca																								
angustifolia									X											X	X			
chrysantha								X	X											X	X	X		
Poranthera																								
microphylla									X											X	X	X		
Pronaya																								
fraseri	X												X	X	X									
Pterostylis																								
vittata																		X	X	X				
**Raphanus*																								
raphanistrum						X	X												X					
**Romulea*																								
rosea							X	X												X	X			
Scaevola																								
canescens					X	X	X	X	X								X	X	X	X	X	X		
paludosa								X	X	X	X										X	X	X	
Schoenus																								
curvifolius							X	X												X				
latitans																X								
Scholtzia																								
involucrata	X	X									X		X											X
**Senecio*																								
vulgaris																		X	X					
**Silene*																								
gallica						X	X	X	X										X	X	X	X		
Siloxerus																								
humifusus																					X	X		
**Solanum*																								
nigrum		X	X				X	X	X	X										X	X	X	X	
Sollya																								
heterophylla	X												X											
**Sonchus*																								
oleraceus									X	X	X		X		X	X	X	X		X	X	X	X	X
Sowerbaea																								
laxiflora							X	X	X															
**Sparaxis*																								
grandiflora								X													X			
**Stachys*																								
arvensis								X	X											X	X			
Stachystemon																								
vermicularis											X		X	X										X
Stipa																								
mollis										X												X	X	
Stirlingia																								
latifolia								X	X												X	X		

Species	1980 J	F	M	A	M	J	J	A	S	O	N	D	1981 J	F	M	A	M	J	J	A	S	O	N	D
Stylidium																								
brunonianum							X	X	X											X	X	X		
calcaratum							X	X	X											X	X	X		
carnosum								X																
piliferum								X												X				
repens			X						X	X					X	X	X				X	X	X	
schoenoides							X	X												X	X			
Styphelia																								
tenuifolia			X	X													X	X						
Synaphea																								
spinulosa						X	X	X											X	X	X			
Thelymitra																								
nuda																				X				
Thysanotus																								
manglesianus							X	X												X				
sparteus										X				X	X									X
tenellus	X														X									
triandrus									X													X		
Trachymene																								
pilosa							X	X												X	X			
**Tribulus*																								
terrestris	X	X	X																					
Tricoryne																								
elatior								X	X												X	X		
**Trifolium*																								
angustifolium								X												X	X			
arvense						X	X	X											X	X	X			
campestre							X	X												X	X	X		
tomentosum								X												X				
Triptercoccus																								
brunonis										X												X		
**Ursinia*																								
anthemoides							X	X											X	X	X	X		
Verticordia																								
densiflora										X														X
**Vulpia*																								
bromoides																				X	X			
Wahlenbergia																								
**capensis*							X																	
gracilenta								X																
Waitzia																								
suaveolens								X	X												X	X		
**Watsonia*																								
meriana								X	X												X	X		
pyramidata								X	X															
Xanthorrhoea																								
brunonis																								
Xanthosia																								
huegelii																							X	X

Table 2: Number of flowering native and weed species per month.

Months	1980 Native	1980 Weed	1981 Native	1981 Weed
J	10	1	19	6
F	7	3	13	2
M	3	5	10	6

A	4	5	13	7
M	12	7	19	5
J	15	5	23	7
J	20	7	26	8
A	35	15	47	23
S	57	27	67	44
O	62	35	68	41
N	47	17	55	24
D	35	2	37	9

Table 3: Major families represented.

Families	Species	Natives	Naturalised
Asteraceae	18	8	10
Epacridaceae	7	7	0
Liliaceae	18	18	0
Myrtaceae	11	11	1
Papilionaceae	20	13	7
Poaceae	20	2	18
Proteaceae	8	8	0
Stylidiaceae	7	7	0

BIRDS BENEFIT FROM PROFESSIONAL FISHING AT MANDURAH, W.A.

By R.H. STRANGER, 28/76 East Street, Maylands, W.A. 6051

INTRODUCTION

It is generally known that birds attend fishing boats and scavenge offal and unwanted fish from them, but precise details are lacking and nothing has been published locally. Hence this paper reports some observations which were made at Mandurah in the early 1970's during professional fishing operations, mostly in Peel Inlet.

Professional fishermen are prohibited by law from catching or marketing fish below a certain size. However undersized fish are sometimes caught during legitimate fishing operations, and, along with non-commercial species, are only cleared from the nets at the fishermen's convenience. Most of these fish are dead or near dead when taken from the nets and are normally discarded. Thus they are easy prey and a big attraction to fish-eating birds.

OBSERVATIONS AT MANDURAH

Pelican *Pelecanus conspicillatus*. Small numbers sometimes congregate alongside the fishermen's submerged nets, removing commercially valuable fish and often damaging the nets. Also when fishermen clear their nets, usually in shallow water close to shore, groups of Pelicans will gather around the boats and readily take most species of fish discarded. They will also try to take fish from inside the boats and have to be discouraged.

Marketable fish such as mullet *Mugil* and *Aldrichetta* spp., Herring *Arripis gorgianus* and whiting *Sillago* and *Sillaginodes* spp. and non-marketable fish such as Trumpeter *Pelates sexlineatus* and Perth Herring *Nematalosa vlaminghi* are eagerly seized, quickly manipulated into position in the bird's beak, and immediately swallowed. However the Leatherjacket *Monacanthus chinensis* is